

# ARCHIVED REPORT

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## PowerJet SaM146

### Outlook

- The only application for the SaM146 engine is the Russian-made Superjet 100 regional airliner
- Sanctions imposed on Russia after the Ukraine invasion prevent delivery of new SaM146 engines to the Superjet program
- Irkut is working on a new Superjet variant with a locally sourced engine

### Orientation

**Description.** Axial-flow aviation turbofan engine developed using European and Russian technology.

**Sponsor.** PowerJet SA, a 50-50 joint venture of Snecma (Safran) and NPO Saturn.

**Power Class.** Range of 15,400-17,800 lbst (68.5-79.2 kN).

**Total Produced.** An estimated 439 SaM146 engines were produced through 2023.

**Application.** Developed for 100-seat class regional jet market.

**Price Range.** Estimated at \$5.6 million.



300th Saturn SaM146 Engine

Photo: NPO Saturn

**PowerJet SaM146****Contractors****Prime**

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**Technical Data**

The PowerJet SaM146 turbofan engine was developed using the Snecma Moteurs DEM21 gas generator and Tech 56 technology as a base.

**Design Features**

**Fan.** A single-stage fan with swept wide-chord blades. The fan diameter is 48.2 inches (122.4 cm), and the bypass ratio is 4.43. Overall pressure ratio at maximum altitude is 28. Specific fuel consumption during cruise is 0.629.

**Compressor.** Three-stage LP compressor, six-stage HP compressor.

**Combustion System.** Convergent-divergent short annular system with step diffuser.

**HP/LP Turbine.** Single-stage HP turbine, three-stage LP turbine.

<b>Model Variant</b>	<b>Maximum T-O Thrust Rating</b>	<b>Application</b>	<b>Units per Airframe</b>
SaM146 1S17	17,300 lbst (76.8 kN)	SSJ 100/95 Basic	2
SaM146 1S18	17,760 lbst (79.0 kN)	SSJ 100/95 Long Range/Business Jet	2

**Dimensions/Weight (both variants)**

	<b>Metric Units</b>	<b>U.S. Units</b>
Length	3.59 m	141.3 in
Fan Diameter	1.2 m	48.2 in
Bypass Ratio	4.43	4.43
Engine Weight, with Nacelle	2,259 kg	4,980 lb
Specific Fuel Consumption (cruise)	0.629	0.629

**PowerJet SaM146****Variants/Upgrades**

**SaM146.** Base model available in two versions, the -1S17 and -1S18. Both have the same specific fuel consumption of 0.629 during cruise. The -1S17 powers the base version of the Superjet 100 and the -1S18 the long-range and business jet variants. The -1S18 features higher takeoff thrust than previous versions of

the engine, enabling the Superjet to operate at higher maximum takeoff weight (MTOW). The higher weight allows more fuel to be carried, increasing the aircraft's range. It uses the same hardware as other engines in the family, requiring no change in aircraft configuration.

**Program Review**

**Background.** The PowerJet SaM146 was developed by PowerJet, a 50-50 joint company formed by Snecma Moteurs (now known as Safran Aircraft Engines) and NPO Saturn specifically to power the Russian Regional Jet (later renamed the Superjet) developed by Russia's Sukhoi Civil Aircraft, which became the regional aircraft division of Irkut in February 2020 (Irkut itself was subsequently rebranded as Yakovlev in 2023).

At the 2004 Farnborough International Air Show, Safran and NPO agreed to create a joint company. The new company was to be in charge of all SaM146 program management tasks, including design, production, marketing, and support. It would have two operating units – one in France and one in the Russian Federation. The foundation documents for the creation of the new entity, PowerJet, were signed on October 22, 2004.

On the same day that Safran and Saturn formalized the creation of PowerJet, the two partners also signed an agreement setting up the VolgAero joint production enterprise. The new entity was tasked with the production of aero engine parts for the SaM146 as well as components for other Snecma Moteurs companies, including CFM56 engine parts for CFM International and parts for industrial gas turbines.

The announced work shares in the SaM146 were as follows:

**Safran Aircraft Engines:** Core engine, control systems and power transmission, systems integration, and flight testing.

**NPO Saturn:** Fan and low-pressure (LP) compressor and turbine, control accessories, and engine assembly for Superjet applications, as well as ground testing.

**Avio:** Singular annular combustor modules, and transfer and accessory gearboxes. Avio took an 8.8 percent share of the SaM146 engine program as a risk-sharing partner within the Safran share.

**Hispano-Suiza** (now a part of Safran): Full Authority Digital Engine Control, or FADEC (as a subcontractor); main fuel pump; hydraulic pumps.

**Aircelle** (formerly Hurel-Hispano, and currently a part of Safran): Nacelles and thrust reversers (as a subcontractor).

**Applications.** The sole application for the SaM146 engine is the Superjet 100/95 regional airliner. The Superjet 100/95 seats 98 passengers in a single-class configuration or 86 passengers in a two-class configuration, both at 32-inch pitch. At 31-inch pitch, single-class seating would rise to 103 passengers. A business jet variant is essentially the same aircraft with a custom VIP cabin installed in place of airline seating.

Production of this version of the aircraft ended in 2022. Sanctions imposed on Russia in the wake of its invasion of Ukraine prohibited the import of western-made parts by the Russian aerospace industry. Yakovlev was forced to launch development of a new version of the Superjet using domestic content in place of imported components, including new Aviadvigatel PD-14 engines in place of the SaM146.

**PowerJet SaM146****Forecast Rationale**

The only application for the SaM146 engine is the Yakovlev Superjet 100 regional jet.

International demand for the Superjet evaporated due to the poor customer support suffered by Superjets purchased by Mexico's Interjet and leased by Brussels Airlines, and Russian airlines are now the only operators of the type.

Russia's invasion of Ukraine in February 2022 led the European Union to impose economic sanctions that

prevented the export of, among other things, aircraft and aerospace components. Safran subsequently announced in March 2022 that it was suspending delivery of new SaM146 engines to Irkut. We believe Safran delivered the last SaM146 in early 2022.

The PowerJet joint venture is likely to dissolve in the near term unless Russia soon withdraws from Ukraine – an unlikely outcome.